

IGNITION OPERATIONS, S-234

UNIT 6 - PRESCRIBED FIRE SAFETY, PREVENTING ACCIDENTS AND DISASTERS

OBJECTIVES

1. Define the difference between the terms accident and disaster.
2. List six recognizable stages of a prescribed fire disaster (Turner's Model).
3. Relate a prescribed fire case study to the developmental sequence of six stages associated with a disaster.
4. Describe adjustments that must be made to ensure the safety of prescribed fire operations.

I. INTRODUCTION

Too often we assume that serious, or even fatal, accidents are only the product of wildfire suppression actions.

Experience, however, has sadly demonstrated a serious loss of life on prescribed burns as well.

An investigative report on one event cited several contributing factors to the fatalities, including a preoccupation with target accomplishment, haste, over-confidence, span-of-control problems, and deviations from the approved plan.

The passage on target accomplishment is worth repeating:

“There has been a strong emphasis in recent years on the importance of prescribed burning in the forest regeneration and forest “health” programs. This has created a requirement to assign and meet targeted areas of prescribed burns. Undoubtedly the District staff, having been leaders in the prescribed burning program for over 10 years, feels this pressure keenly. These pressures were felt strongly and personally by the senior fire staff, who transmitted them to subordinate staff.”

II. ACCIDENT VS. DISASTER

A. Accident.

Unwanted events caused by individuals who do not adequately use shared beliefs to account for and cope with the hazardous situations they face.

In other words, an accident is simply a result of an individual’s failure to conform to existing precautions.

B. Disaster.

An event, concentrated in time and space, which threatens people with major unwanted consequences as a result of the collapse of precautions which had hitherto been culturally accepted as adequate.

The links are in and of themselves a series of failures which become accepted as the “norm” and accumulate slowly over time ultimately leading individuals or groups toward an unwanted and unexpected event: attitudes with regard to a specific behavior which don’t allow us to see beyond our own confidence = an unexpected “bad” outcome.

EXAMPLES:

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Let’s look at the six stages to a disaster: (Adapted to the prescribed fire situation from Turner’s “The Development of Disasters - A Sequence Model for the Origin of Disasters”, Sociological Review 24 (1976):753-774.

Stage I: Pre-disaster Starting Point: Initial culturally accepted belief about prescribed fire hazards. Associated precautionary rule set out in laws, guidelines, policies, etc.

Stage II: Incubation period: the accumulation of an unnoticed set of events which are at odds with the accepted beliefs about prescribed fire hazards and the precautions to avoid these hazards.

Stage III: Precipitation Undesirable Event: Undesirable prescribed fire situation which forces a re-direction of attention and transforms general perceptions of Stage II.

Stage IV: Onset: The immediate consequences of the collapse of cultural precautions regarding prescribed fire become apparent.

Stage V: Suppression, Rescue, and Salvage - First stage adjustment: The immediate post-collapse situation is recognized in ad-hoc adjustments which permit the work of fire suppression, rescue, and salvage to be started.

Stage VI: Full cultural adjustment: An inquiry or assessment is carried out and beliefs and precautionary norms regarding prescribed fire are adjusted to fit the newly gained understanding of the character of prescribed fire hazards.

III. GERALDTON PB-3/79 CASE STUDY

Was this case study and accident or disaster?

Was this tragic event simply the result of people not following established beliefs, guidelines, practices and policies related to prescribed fire? Or was there a subtle accumulation of unnoticed events which were at odds with accepted beliefs about prescribed fire hazards and the precautions taken to avoid these hazards?

IV. GERALDTON PB-3/79 AND TURNER'S SIX STAGES

Let's take a closer look to see how well the Geraldton Case Study fits Turner's model with respect to stage I? What was the culture on the Geraldton District?

A. Stage I - Pre disaster Starting Point

The disaster sequence commences with a set of culturally held beliefs about prescribed fire hazards. The beliefs constitute the "normal" stock of knowledge which is thought to involve individuals and groups to survive successfully in a hazardous situation.

These normal beliefs are fundamental to the concept of an accident caused by an individual. We would then simply look for a violation of laws, policies or guidelines to provide an explanation for the injury. Once fault is found we need look no further. This concept is in and of itself the culture.

The Geraldton District in Ontario Canada had used prescribed fire as a part of their resource management program since the late 1950's.

Knowing that they had been developing a prescribed fire program for approximately 20 years we can make some assumptions that would allow us to agree that a culture with regard to prescribed fire had been established.

1. The fact is that there was a set of accepted beliefs, guidelines, and policies about prescribed fire hazards in Ontario.
 - Forest managers were committed to an increasing the prescribed fire program.
 - The program was taking advantage of advances in training and technology.
 - Apparently burn plans were a matter of policy and included a burning prescription (which was tested using computer programs), firing patterns, and an organization. In addition, test fires were used as a normal procedure.
2. Let's take a closer look to see if we can get some insight into the culture that existed prior to the Geraldton Incident.

Key indicators may be:

- The apparent use of a test fire as a formality, rather than a true evaluation of expected fire behavior.
- The seemingly informal and ineffective briefing/communication that occurred prior to ignition.

- Finally, the numerous deviations from the approved plan. As contributing factors to the final outcome, were these actions and attitudes confined only to this project?

B. Stage II - Incubation Period

1. A prescribed fire disaster or cultural collapse occurs because of some inaccuracy or inadequacy in the accepted norms or beliefs. If the disruption is to be of any consequence the discrepancy between the perceptions of prescribed fire hazards and the way prescribed fire hazards really operate will not generally happen instantaneously. Instead, there is an accumulation, over a period of time, of a number of events which are at odds with the way things really are and the hazards represented by the norms and beliefs. Within this “incubation period” events occur and accumulate unnoticed or it may be that they were not communicated.

Existing cultural precautions may be thought of as dealing with known and clearly defined hazards, but during the incubation period vague and unperceived hazards begin to be covertly delineated.

2. In order for events to build up in this way it is clear that they must fall into one of two categories: either they are not known to anyone; or they are known but not fully understood.

3. This incubation period may also be referred to as the “getting away with it” period which becomes culturally acceptable. This is a slow process where small incremental steps go unnoticed. There are five basic reasons for this to occur:
- People are generally reluctant to fear the worst, with the result that they dismiss evidence of hazardous conditions and fail to notice warning signs of accumulating danger. How often do you share “near misses” during post-burn evaluations? Do they become the impetus for course correction or do they just become war stories?
 - Violations of prescribed fire policies and rules may become accepted as normal when people obtain misinformation or fail to learn appropriate beliefs and norms.
 - Information overload in complex situations may be so much of a problem that people fail to see signs of danger. This is a “head down” situation, when folks become preoccupied with details and fail to step back and see the overall situation.
 - People’s attention may be directed from warning signs by one problem that acts as a decoy to draw attention away from another more serious problem. These decoys can take many forms. They may be personal or professional and they may also be imposed by other individuals.

- Prescribed fire which may escape at rather frequent intervals tend to elicit the development of institutions suited to routine accidents rather than disasters. We dismiss the escapes in the name of production, lack of funds, or lack of more skilled people, until at some point the escapes become culturally acceptable.

4. What we've been talking about are the ways in which events or the links accumulate. Remember the links to a disaster are like a slow motion wave, which when it finally crests, is overwhelming. There may well have been an accumulation of events from the late 1950's to 1979 that detracted from implementing normal prescribed fire precautions on the Geraldton District.

If we look at some of the details we may gain better insight to the development of the incubation period and the events that might gradually have accumulated to affect Geraldton's prescribed fire program in a detrimental manner.

5. The approved plan was not entirely duplicated in the actual preparations for the burn. This is apparent in a number of ways and is attributable to a number of factors.
 - a. Target Accomplishment: There was a strong province-wide emphasis on the importance of prescribed burning. This created a requirement to assign and meet targeted areas of prescribed burns.

Undoubtedly, the Geraldton District staff, having been leaders in the prescribed burn program for over 10 years felt this pressure keenly.

In the case of the PB3 burn, there was the added element of “time running out”. With the probability of very few satisfactory burning opportunities left in the fire season and the certainty that most fire control staff would be lost within two weeks, the District was in a “now or never” situation.

These pressures were felt strongly and personally by the senior staff, who transmitted them to subordinate staff.

b. Haste: The pressures referred to in the previous discussion coupled with the “time running out” problem, and the probability that an acceptable burn might be achieved immediately, inevitably led to haste. The burn was ignited less than 24 hours after Bateman and Hilliard checked slash fuel conditions. Many evidences of haste, were exhibited :

- Examination of fuels at Fire 13 instead of at PB-3 to determine suitability for burn.
- Fuel volumes not computed, although sample plots were in place and the data had been collected.
- Hasty organization of staff (e.g., Reynolds did not know his assignment until Wednesday morning).
- Key people not included in the briefing (e.g., members of Reynolds’s ignition crew).
- No detailed on-site briefing of the ignition crew.

- Not all staff briefed on safety measures and instructions were vague.
 - Very little time spent on the test fire.
 - Equipment was incomplete (e.g., no funnel to fill torches, no relative humidity tables, torches at the burn without fuel, etc.).
 - Ignition started without waiting for all of the staff to reach the staging area.
- c. Over Confidence: From the start and for a number of reasons, everyone involved thought that PB-3 would be easy to manage and would pose no problems except perhaps that the fire intensity would be too low.

As already pointed out, the Geraldton District had been an active participant in a prescribed burn program. The staff developed expertise through the process of planning and conducting many prescribed burn projects. It is understandable that there would be little concern about their ability to manage PB-3.

Reinforcing the district's confidence was the fact that this was a simple, safe burning opportunity which even under sever conditions would offer no fire problems.

Furthermore, burning conditions were not severe and the forecast indicated rain no later than the evening of the day of the burn.

The final factor contributing to the lack of concern was the test fire set minutes before the ignition of the unit. Its initial slow rate of spread indicated that to the observers that the only problem they would have would be getting the main fire to burn.

- d. Span of Control: It is obvious in hindsight that there were span-of-control problems with ignition. In fact, Reynolds recognized the problem on Block C and drew it to Hilliard's attention before leaving the base camp. Some evidence of the span-of-control problems are:
- There was not a completely clear picture of ignition sequences and details.
 - Reynolds, Hilliard, and Bateman all gave some instruction about ignition. In itself, this is not necessarily bad, but it is an indication of the lack of "central" ignition control.
 - The large number of ignitions made control difficult.
- e. Deviations from Plans: Deviations of varying magnitudes were made from the original plan and from plans developed during the organizational stages. Most of the changes were reasonable, but rationale for others is questionable.

- f. Inadequate staffing levels: Although the approved plan does not attach names to positions, the District policy would have indicated Shepherds as Fire Boss and Johnson as Trainee Fire Boss. With Shepherds on vacation and Johnson on a day-off and unable to be located, Hilliard and Reynolds were logical alternate choices. Bateman might have assumed the Fire Boss role if his knowledge of the burn area and plan had not been so limited.

The approved plan indicated a Safety Officer reporting to the Fire Boss, but this position was left vacant for reasons unknown.

- g. Inadequate support staff: The most significant deviation was the number of ignition/suppression support staff assigned to the burn. A detailed comparison of the original plan and the final real situation can be made elsewhere in the report, but in general terms, there were more than twice as many people on the burn as planned. On Block C alone, there were 22 people compared with the maximum of seven implied in the plan.

The most serious product of this change was the assignment of seven inexperienced people to Dalton.

- h. Equipment: Aerial ignition had originally been planned as a possibility for all or part of the burn, with alternate ignition methods to be used if a helicopter was not available. The fact that hand ignition was employed was, therefore, not a deviation from the plan.

6. The Board of Review also presented serious reservations about another commonly accepted precaution that being the heavy reliance on the spot test fire as a last-minute guide to expected fire behavior. This is point worth discussing further, since the use of spot test fires is still a common practice. Some food for thought meant to provide a caution about their use.

- A single spot ignition has a tight convex fire front, which may be quite different from the specific firing pattern being used.

This aspect should be evaluated because you may not be replicating actual conditions and a spot ignition may produce much lower rates of spread and fire intensity than a strip head fire.

- Even under strong wind, a spot test fire may elongate downwind and fail to develop the faster moving wide front perpendicular to the wind that is commonly seen with various firing patterns.
- Any given spot may not be representative of average burning conditions in terms of slope, fuel load and continuity, or exposure to wind.
- Finally, the test fire, in a sense, negates the formal process of estimating spread rates well in advance from the combination of fire danger indices and previous burning experience.

It is probable that more than 10 minutes would have been required for the test fire at PB-3 to develop its equilibrium fire spread, and even then nothing like the fire behavior of the real fire would have resulted. A test fire, to be a fair indication of potential fire behavior, would have to simulate reasonably well the actual ignition pattern employed.

C. Stage III - Precipitating Event

1. The shock of a precipitating event is necessary to re-direct attention to the accumulation of unnoticed errors in the incubation period. The power of the precipitating event to transform beliefs and precautionary rules regarding prescribed fire is dependent upon total surprise.

Although there may be a few “soothsayers” that predicted the event, general recognition of the underlying process which gave rise to significant fire losses will not occur unless it is unexpected.

2. A transformation of culturally accepted prescribed fire beliefs and policies will occur only if a disastrous event is totally unpredictable. As previously discussed the expectation on PB-3 burn was that fire intensity and rates of spread would be low within the narrow window of opportunity. The occurrence of high intensity fire behavior was not predicted.

D. Stage IV - Onset

1. The outbreak of a disastrous prescribed fire is followed immediately by the onset of unanticipated consequences which force practitioners to face realities not accounted for by existing prescribed fire measures. The onset of the prescribed fire disaster is represented by high intensity burning, rapid rates of spread, large area burned, and lives and property lost.
2. How many times have you done a prescribed burn where all of the environmental parameters were aligned on the high side and gotten away with it? While most of the indices were well within the prescription parameters, there were seven fatalities and one serious injury on PB-3, which signaled the collapse of their cultural precautions.

E. Stage V - Suppression, Rescue, and Salvage

The onset of a disastrous prescribed fire is accompanied or followed by suppression, rescue, and salvage operations.

Major features of a failure in existing beliefs and precautions become evident as people go about meeting immediate problems of suppression, rescue, and mop-up. On the PB-3 burn immediate post-collapse adjustments were made in terms fire control and mop-up, in order to facilitate rescue and ultimately the recovery of those who perished in the fire.

F. Stage VI - Full Cultural Readjustment

After an agency has recovered from the immediate impacts of the onset of a disastrous prescribed fire, an assessment may be conducted to determine why culturally accepted precautions proved to be inadequate.

Readjustments can only take place if the investigation reveals major failure of the existing beliefs and precautions. Following the Geraldton Incident an inquiry was conducted by a Board of Review and precautionary norms regarding prescribed fire were adjusted to fit a newly gained understanding.

The Board of Review listed 21 recommendations following their analysis of the PB-3 burn. These recommendations were the foundation for their cultural readjustment.

V. Recognizing Your Local Culture

Now that we have an understanding of Turner's model as it applies to the Geraldton Incident let's apply the concepts of Stage I and Stage II to our own local environment.

- It is important to understand where we are culturally and whether any of our standard operating procedures or adaptations that we carry out constitute an incubation period.

VI. SUMMARY

Prescribed fire activities are increasing in frequency and complexity for most resource management agencies. These prescribed fire programs also have included cases of serious loss of lives and property since 1979.

Although often taken for granted, prescribed fires offer some of the most potentially hazardous situations that we undertake. The very continuance of such programs is closely dependent on the care and skill we bring to this task. So that we don't become trapped, or surprised, by the unexpected, we have contrasted the terms "accident" and "disaster" and listed the six stages associated with a prescribed fire disaster. A case study was employed to illustrate these six stages and to call attention to the accumulation of an unnoticed set of detrimental events during the incubation stage. Finally, we described and discussed adjustments that must be made to ensure the safety during prescribed fire operations.

The message is clear, we must always maintain a healthy respect for fire, apply the fundamentals that we know so well to prevent accidents, and be alert toward changing conditions to prevent disasters.

